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ARTICLE

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FISH PRODUCTION TREND IN COLD WATER STRETCH OF THE GANGA RIVER

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The fisheries of the Ganga River, including small-scale and artisanal practices, play a significant role in the inland capture fisheries sector. In its upper stretches, the river flows through diverse climatic and geographical regions, fostering a variety of fisheries. As water temperatures in the hilly areas drop below 20°C, the upper stretch of the Ganga is dominated by coldwater fish species such as Mahseer and others that thrive in cooler conditions compared to Indian Major Carps (IMCs). The coldwater fisheries here comprise species like exotic brown trout (Salmo trutta fario), snow trouts (Schizothorax and Schizothoraichthys spp.), Mahseer (Tor putitora), Indian hill trouts (Barilius spp.), sisorids (Glyptothorax spp.), and minor carps (Labeo dyocheilus, L. dero, Garra spp., Crossocheilus latius). Unfortunately, many of these species are categorized as threatened due to their declining wild populations. They face multiple challenges, including overfishing, illegal fishing practices, ecosystem disruption, and and the far-reaching effects of climate change. Conservation measures are crucial to safeguarding these fish populations and ensuring the long-term sustainability of fisheries in the Ganga River.

Introduction

Uttarakhand is located between latitude 280 40'-310 29'N and longitude 770 35'-8105' E covering about 53,566km^2 in Northwest Himalayas. The state has a unique ecology that provides vast and varied fisheries resources, include the two mightiest river systems, the Ganga and Yamuna and their many tributaries, like Alaknanda, Bhagirathi, Yamuna, and Mandakini, as well as natural lakes, man-made reservoirs, and ponds. While the Ganga River is known for its diverse fish populations, the fisheries of coldwater stretch of Ganga River harbors both native and commercially significant fish species. These include major carps (*Labeo rohita, L. calbasu*), minor carp (*L. bata, L. dero*), exotic carp (common carp), cold-water fish species such as snow trout (*Schizothorax* and *Schizothoraichthys* spp.), Mahseer (*Tor putitora*), Indian hill trout (*Barilius* pp.), *Garra* spp. and Sisorids (*Glyptothorax*) particularly in the Himalayan region of the upper Ganga. Exotic brown trout (*Salmo trutta)* established in uplands streams and rivers of the state as an introduced species.

The fisheries of the Ganga River, including small-scale and artisanal practices, are a major part of the inland capture fisheries sector. A total of 522 endemic species from India, Ganga basin[1] itself harbor around 11% of it. Since water temperature in the hills falls below 20°C, Mahseer and other coldwater fishes that can grow and survive at a lower temperature than IMCs dominate in the upper stretch of Ganga River. Even exotic species like common carp which has been introduced in Tehri reservoir, plays a significant role in increasing fish production in

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the hill region of the Ganga River.However, miscellaneous groups of fish contribute, significantly to the fish production at Haridwar. Mahseer (*Tor putitora*) and snow trout (*Schizothorax richardsonii*) remain significant contributors to fish production in the upstream of the Ganga River at Tehri and Uttrakashi, respectively.

Materials and Methods

Study Area: The Ganga River flows through several climatic and geographical regions in its upper stretch. These diverse climate and geographical characteristics allow for diverse fishery. The upper stretch of Ganga River can be divided into the following zones for different fish species, including trout, mahseer, and carp based on altitude and temperature. Trout Zone: Areas above 4000 feet where temperature is below 12°C, Snow trout and Mahseer Zone: Areas below 4000 feet located in the central Himalaya where temperature is below 20°C, and Carp Zone: Plain areas of the upper stretch of Ganga River like Haridwar and Dehradun.

Data Collection and Analysis: Monthly assessments were made during 2024-2025 at Ajitpur and Tehri landing center to assess the fish production. The catch data were obtained from fish landing centers and also from local fishermen who fish for their livelihoods. Since, the fish obtained from them were already dead, they were preserved in 10% formalin and brought to the research facility for identification and segregation of different fish species with the help of Day[2]. To identify the dominant fish species, potential changes in fish diversity, and fish production trend the species composition of fish catch at each landing center was analyzed.

Results and Discussion

Fish Biodiversity: Previously, Sarkar et al.,[3] conducted an investigation in the freshwater zone of the Ganga River, providing a detailed account of the distribution of 143 fish species, classified into 72 genera across 32 families. However, Das et al.[4] recently reported re-exploration of the diversity and distribution pattern of 190 fish species, classified into 133 genera across 62 families and 23 orders, spanning from the headwater (Harshil) to the estuarine (Hooghly estuary) stretch of the River Ganga.

Major Fish Species of Cold Water Stretch of the Ganga River

Snow Trout: The fishes of sub family Schizothoracinae (family Cyprinidae) are commonly known as snow trout[5]. They prefer the rapid water of the hill streams where the temperature ranges between 8-20°C. Snow trout consists of two genus (i) *Schizothorax* (Heckle) with suctorial lower lip and (ii) *Schizothoraichthys* (Mishra) in which lower lip is non- suctorial[6]. In the upper stretch of Ganga River, two species of *Schizothorax* namely *S. richardsonii* (Gray) and *S. plagiostomus* (Heckel)are dominant. Their size ranges from 20-50cm and locally known as "Asela". The other genus *Schizothoraichthys* has one species *S. progastus* (McChaland) which is quite common in the upstream of the Ganga River. Snow trout constitutes about 80% of the total catch in the upper reaches of the Ganga River at Uttarakashi. However, the percentage of snow trout in the catches is very low in the Tehri and Haridwar.

The endemic genus *Schizothorax* has been negatively affected by human made disturbance in the natural ecosystem during past few years in the upper stretches of the river which has resulted in disasters like the blockades and flash floods. Thus, the presence of the fish has declined not only due to overfishing, use of illegal methods of fishing, but also due to changes brought about in the river by natural disasters and hydro power projects.

Mahseer: The golden Mahseer (*Tor putitora*) is large cyprinid fish, inhibiting and widespread in the upstream of the Ganga River. They prefer the hilly river with a stony and rocky river bed. This species can live and withstand temperatures between 8 to 25° C. It can migrate according to climatic conditions for its feeding and breeding. Mahseer migrate upstream during monsoon to find the suitable spawning grounds.

The Golden Mahseer, known for its significant size, holds considerable importance. This fish is a good source of protein, so as a food, it is highly valued and fetches a high market price. Mahseer abundance constitutes 70% of the total catch at Tehri reservoir in the upstream reaches of the Ganga River. The Mahseer population has been declining both in quantity and size in Uttarkashi and Haridwar along the Ganga River. Mahseer is responsible for balancing the ecological pyramids by playing an important role in upper stretch of Ganga River where it occupies a wide range of food web[7]. The various anthropogenic activities such as dynamiting and fish poisoning in the headwater and the stream therein have threatened the mahseer population in the wild habitats and are at present considered as endangered[8].

Fish Production: In the past few years, the middle stretch of the Ganga River has been considered as major fish producer area[9]. However, in the upper stretch of the Ganga River there exists a significant production of IMCs

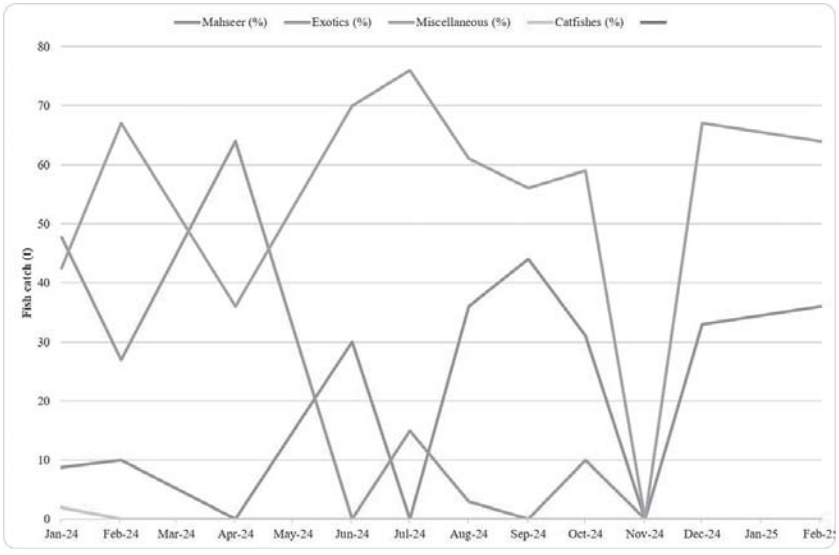

Fig.1. Monthly landing data of Haridwar during 2024-2025

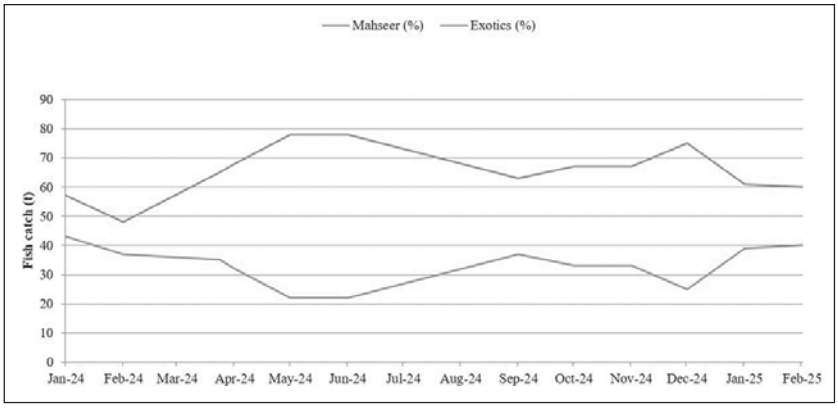

Fig.2. Monthly landing data of Tehri dam during 2024-2025

and exotic carp. The annual fish landing in Haridwar was observed 7.518 tons during 2024-2025. The dominance of miscellaneous group contributed the highest percent (59.8%) of the total fish catch, followed by mahseer (22.8%), exotic (16.6) and catfishes (0.19%) at Haridwar (Fig. 1).

While the annual fish landing in the Tehri dam was observed at 13.225 tons during 2024-2025. Overall, Mahseer contributed the highest percent (66.4%) of the total fish catch followed by exotic (33.5%) at Tehri dam (Fig. 2).

Conclusions

The Ganga River in coldwater stretch supports a diverse fish population, including commercially important species like mahseer, and coldwater species like snow trout. The rivers' fish diversity is influenced by altitude and temperature, with different zones supporting different species. In this stretch, the Ganga River exhibits a concerning trend of declining fish production, mainly affecting snow trout and mahseer species. While the Ganga River's fisheries are a significant part of the local economy, they face threats from overfishing, habitat destruction, and natural disasters. Conservation efforts are needed to protect the river's fish populations and ensure the sustainability of its fisheries.

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